



## Maryland Department of Natural Resources

### Maryland Geological Survey

2300 St. Paul Street  
Baltimore, Maryland 21218  
Telephone: \_\_\_\_\_

William Donald Schaefer  
*Governor*

February 12, 1990

Dr. Thomas R. Anderson  
Berkeley Antibody Company  
4131 Lakeside Drive  
Suite B  
Richmond, California 94806-1965

Torrey C. Brown, M.D.  
*Secretary*

Kenneth N. Weaver  
*Director*

Emery T. Cleaves  
*Deputy Director*

Dear Dr. Anderson:

I am very pleased to learn of your interest in using the collection of curated, unwashed tools from the Higgins site (18AN489) in developing techniques for the identification of blood residues at the family, genus and species level. Due to poor preservation in sandy Coastal Plain soils, the Higgins site yielded little organic material. This analytical technique could, therefore, provide valuable subsistence data that is currently lacking for this site, as well as for the Paleoindian and Archaic period in the Middle Atlantic region in general.

We have a collection of 127 curated, unwashed artifacts including projectile points, scrapers, bifaces, retouched flakes, and hammerstones recovered from Paleoindian, and Early, Middle, and Late Archaic components at the site. In many cases, we have also curated soil from the pedestals underneath these artifacts. Twenty artifacts have already been spot-tested for the presence or absence of blood residues by the University of Delaware Center for Archaeological Research. Methodologically, it would be interesting to evaluate these (still dirty) tools again by your more sensitive technique to see if the same results were achieved.

We would also make available a larger sample of our unwashed artifacts for testing. Given the limited number of test options available, I would hope that you could obtain data for us on a wider, but less specific, faunal range. We have a particular interest in smaller game. Since we are near a major estuary and on a major flyway, tests for antibodies from the waterfowl anatidae family would seem appropriate, along with tests for rodents like squirrel, beaver, woodchuck, etc., and lagomorphs. Testing for larger game like cervids would also be a logical choice.

We would prefer that your staff elute the blood residues from the artifacts and are willing to ship them to  
DNR TTY for Deaf: 301-974-3683

2

you given a firm schedule for their return. I recall that Hyland suggested using sonic "cleaning" techniques. We have no objections to this and hope that the most efficient methods will be employed.

Because we collected extensive palynological and pedological and geochemical data from the Higgins site for detailed paleoenvironmental reconstruction, any sort of faunal data we can acquire will be used to augment and test our model. The Higgins site is virtually the only site in Maryland with type of data available. It is also the only known site in the state with an intact excavated Paleoindian component, and one of very few sites with buried, intact Archaic occupations.

I am enclosing a copy of a paper on the Higgins site excavations to provide you with some background information on the site. We would appreciate information on the personnel involved, and a copy of the research design for your proposal when it is ready. Best of luck!

Sincerely,

*Carol A. Ebright*

Carol A. Ebright  
Principal Investigator

# **BAbCO** BERKELEY ANTIBODY COMPANY

January 22, 1990

Carol Ebright  
Maryland Geological Survey  
2300 St. Paul St.  
Baltimore, MD 21218

Dear Dr. Ebright:

Berkeley Antibody Company (BAbCO) was recently awarded a Phase I Small Business Innovative Research (SBIR) Grant award from the National Science Foundation (NSF) to develop immunoassays capable of identifying the species of origin of blood residues on archaeological artifacts. Our efforts in collaboration with the Cultural Resource Management Program (CRMP) at the University of Pittsburgh have indicated that preserved blood residues can indeed be recovered from artifacts and identified.

Based on preliminary data indicating that blood residue on a tool from the Shoop Site in central Pennsylvania was derived from a cervid, the NSF funded our efforts to develop immunological capabilities to analyze artifacts from three specific archaeological sites. We have developed antibodies capable of distinguishing among blood residues from pronghorn, elephant, and bison in order to analyze a lithic assemblage from the Mitchel Locality, Folsom Site, eastern New Mexico. An additional group of antibodies for deer, elk, caribou, and moose was generated to analyze a sample of tools from the Shoop Site, and a third set of antibodies were produced for the analysis of a putative animal skin burial shroud from the Windover Site, Florida.

We are about to apply for a Phase II Award to support continued development of these immunoassays. Toward that end, I am writing you to inquire whether or not such an analytical approach might be applicable to artifacts in your collection. Such analysis need not be limited to the species indicated above nor to purely lithic collections. It is our intention to develop antibodies which bind to blood from other species and to apply the procedure to other materials such as ceramics, bone, wood, and perishables, as well as lithic assemblages.

2

Carol Ebright  
Page Two  
January 22, 1990

We would be interested in collaborating with you in this regard if such materials exist in your collection. If that is the case, please contact me at your earliest convenience to discuss the possible collaboration in more detail.

I am looking forward to hearing from you and to the possibility of working with you in the future.

Sincerely

A handwritten signature in black ink, appearing to read 'T.R. Anderson', with a long horizontal flourish extending to the left.

Thomas R. Anderson, Ph.D.  
President & Director of Research

TRA:nmb



# BAbCO BERKELEY ANTIBODY COMPANY

February 5, 1990

Dr. Carol Ebright  
Archeologist  
Maryland Geological Survey  
Division of Archeology  
2300 St. Paul Street  
Baltimore, MD 21218

Dear Dr. Ebright:

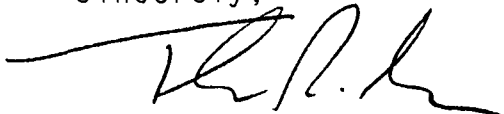
I very much appreciated your telephone call of last week and am looking forward to the opportunity of collaborating with you in the future.

As you know, we have developed antibodies against hemoglobins from several different species and have been applying them to the identification of the species of origin of blood residues on archaeological artifacts. We have antibodies against ten different species at present, a good immunological library for analysis of your collection. In addition, there is no reason that the tools need to leave Minnesota, elute the blood residues in your laboratory and forward the eluates to us here at BAbCO for analysis. !!

I would like to ask a favor of you. We are about to apply to the NSF for additional funds to continue our work. In that regard, it would be quite useful if you would write me a letter indicating your interest in the project, the availability of artifacts for analysis using our assays, and your eagerness to collaborate with us in the future. Such a letter would no doubt help us get funding to continue the work.

Again, thank you for your assistance and I am looking forward to speaking with you again soon.

Sincerely,



Thomas R. Anderson, Ph.D.  
President & Director of Research

TRA:nmb

cc: Dave Hyland, University of Pittsburgh

4131 Lakeside Dr., Suite B, Richmond, CA 94806-1965  
Phone 415 · 222 · 4940 FAX 415 · 222 · 1867

18 AN 489  
(Higgins Site)

## Soil Sample

Block 1 B-7 #174 - - -

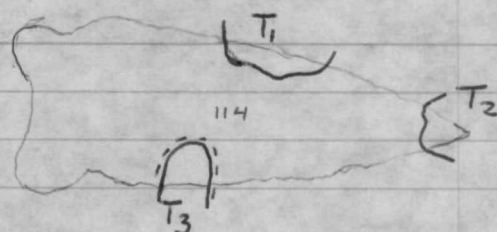
Block 3 B-7 #176 - - - ; rock -

Block 2 B-2 #175 - - -

## Artifacts

### Block 1 A

1781.002 #114 quartz sidenotched point  
- - -



### Block 1 B

#71 Bare Island  
- - -

2470.002

#146 quartz biface  
- - -

2112.001



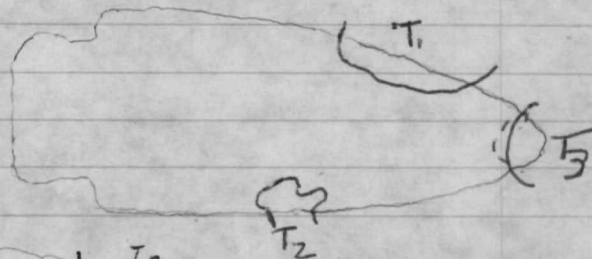
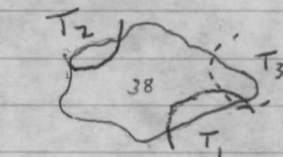
### Block 1 C

#38 rhyolite contracting stem  
- - -

3660.001

#42 quartz Bare Island  
- - -

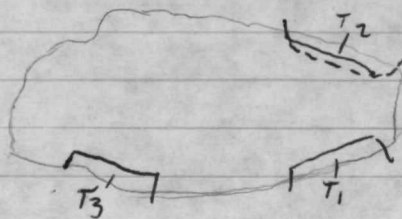
2820.001



#119 Expanding stem rhyolite

3284.003

T<sub>1</sub> - T<sub>2</sub> - T<sub>3</sub> -

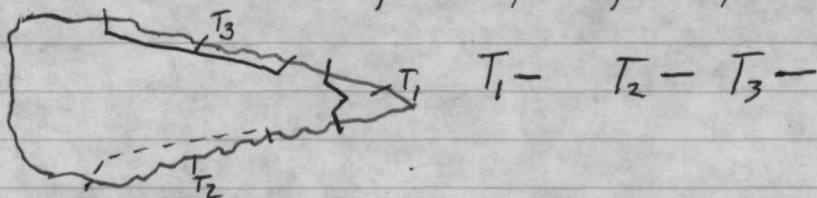


18 AN 489 (Higgins Site)

Block 3

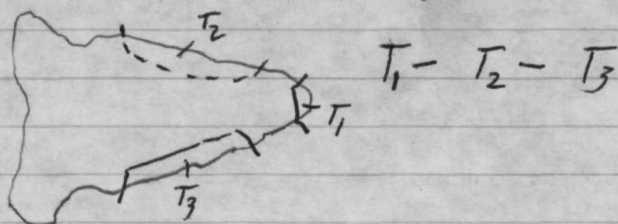
# 94 Kirk rhyolite expanding stem point

1195.001



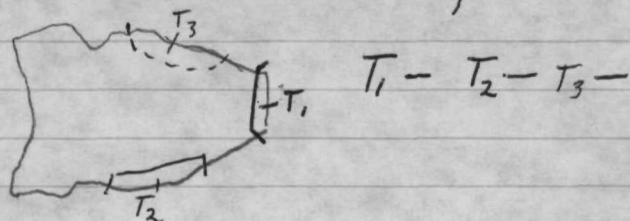
796.001

# 81 Otter Creek quartz side-notched point



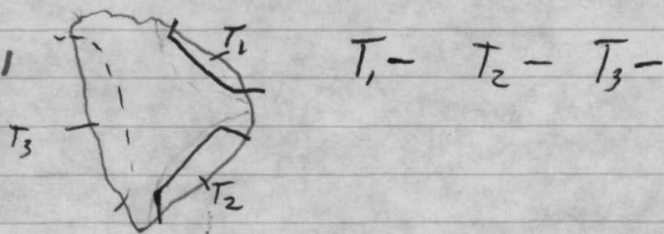
# 82 Otter Creek rhyolite side-notched point

793.001



# 165 Quartz biface

~~1090.001~~  
1090.001



# 178 Gneiss groundstone  
1150.001

Untestable -- too porous

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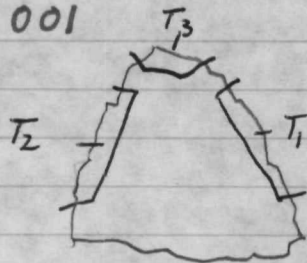
Test Summary: All soil, rock samples tested negative. 11 tests  
 All artifacts tested negative. 15 tools 46 tests  
 57 tests total

18AN 489 (Higgins Site)

Block 2

#145 Quartz biface

4018.001

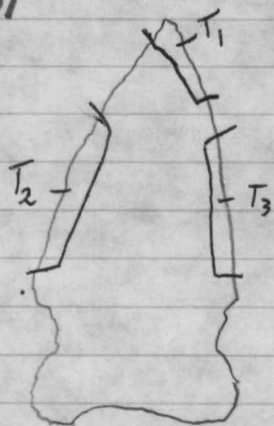
 $T_1 - T_2 - T_3 -$ 

#177 Limonite sample

 $T -$ 

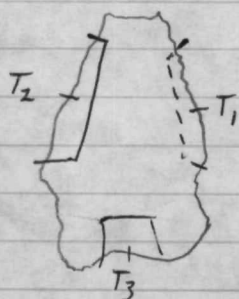
#54 Otter Creek rhyolite side-notched point

4068.001

 $T_1 - T_2 - T_3 -$ 

#87 St. Albans quartz side notched point

4006.001

 $T_1 - T_2 - T_3 -$ 

[---] indicates test on reverse side of artifact



18 AN 489  
(Higgins Site)

Block 1

# 150 Quartz scraper

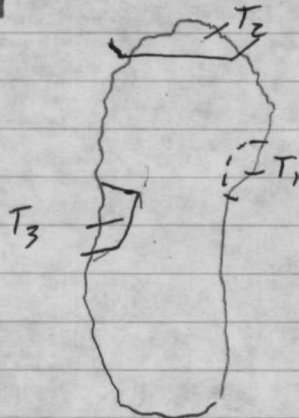
3301.001



T<sub>1</sub> - T<sub>2</sub> - T<sub>3</sub> -

# 153 retouched Quartz core

3113.001



T<sub>1</sub> - T<sub>2</sub> - T<sub>3</sub> -

Project file \_\_\_\_\_

TELEPHONE MEMORANDUM

MGS Staff member EBright

Person contacted Keith Doms

Telephone number (302) 451-6590

Project name Higgins Phase III

Site number (if applicable) 18AN489

Date 4-18-89 Time \_\_\_\_\_

Notes:

Doms called For Custer concerning blood residue  
tests on the 20 samples we sent him. The dirt + rock  
samples produced no False positives. All the artifacts came  
out negative. He will return them registered mail.

Action needed:

Other staff to be alerted:



# University of Delaware

COLLEGE OF ARTS & SCIENCE  
DEPARTMENT OF ANTHROPOLOGY  
NEWARK, DELAWARE 19716

(302) 451-2802

April 18, 1989

Carol Ebright  
Division of Archaeology  
Maryland Geological Survey  
2300 St. Paul St.  
Baltimore, MD 21218

Dear Carol:

Enclosed are the artifacts and results of blood testing from the Higgins Site. There were no positive reactions from any of the control samples or any of the artifacts. These findings mean that there is no blood present on the tools now, not that they never had blood on them.

This letter also serves as the invoice for the \$100 cost of the analysis. The check should be payable to the University of Delaware and sent to my attention.

If I can provide further information, please let me know.

Sincerely,

A handwritten signature in cursive script that reads "Jay F. Custer".

Jay F. Custer  
Associate Professor

JFC/je

Enclosures

Block 1C

✓ #42 Bone Island \* Q  
 ✓ #153 retouched core Q  
 ✓ #174 soil sample —  
 ✓ #38 Contracting stem \* R  
 #150 scraper Q  
 ✓ #119 Expanding stem \* R

1B

✓ #146 biface Q  
 ✓ #71 Bone Island Q

1A

✓ #114 Otter Creek? Q

Block 2

✓ #87 St. Albans \* Q  
 #145 biface Q  
 ✓ #54 Otter Creek \* R  
 #175 soil sample —  
 #177 rock sample L

Curate remaining  
 tools dirty

Sample given to  
 Jay on 4-12-89

Block 3

✓ #94 Kirk \* R  
 #81 Otter Creek \* Q  
 #82 Otter Creek \* R  
 ✓ #178 Groundstone Hornblende gneiss  
 ✓ #165 biface Q  
 ✓ #176 soil sample —

\* pedestal sample exists



CY16

DNR REQUEST FOR SERVICE, MAINTENANCE OR CONSTRUCTION

PO-4

- ☒ Request for Services \$200.01 - \$999.99  
☐ Request for Services \$1,000 - \$7,500  
☐ Request for Maintenance less than \$7,500  
☐ Request for Construction less than \$7,500

AGENCY CONTROL NUMBER

Requesting Unit Name	Appropriation Code	Fund	Date
MGS / DOA	30.01.11.007.002.08.09	.01 Reim	

Description and Justification of Service:

Do blood residue testing on soil, rock, and artifact samples from the Higgins site.

The analysis is necessary to complete site interpretation and report preparation to comply with Federal + State legislation on archeological work relating to State Highway projects.

Total Contract Cost	Term of Contract	Contract I.D.#	Procurement Method
\$600.00			

Vendor Name and Address Selected:

Center for Archeological Research  
University of Delaware  
Newark, DE

Is selected vendor a State or Self-Certified Minority firm? \_\_\_\_\_

How many Minority Firms were solicited? \_\_\_\_\_

If there were 'O' Minority Firms solicited, state reason why: None are available

☐ Sub contract ☐ Prime

I certify that sufficient funds are available and X have, \_\_\_\_\_ have not been provided in the budget for the services requested. If funds have not been specifically provided in the budget for the requested services, funds will be available from the following source: (in budget to SHA)

Higgins site Data Recovery budget

Justification or additional comments regarding procurement method:

University of Delaware is the only commercial provider of this analytical technique.

Attachments, if appropriate:

- ☐ Oral Solicitation form (P.O.2)  
☐ Copy of written or published solicitation.  
☐ Copy of bid board or newspaper notice.

Unit approval:

Procurement  
Office  
Approval

Date

Date

Date

DEPARTMENT OF NATURAL RESOURCES  
SOLE SOURCE/NO SUBSTITUTE PROCUREMENT DETERMINATION

DATE: \_\_\_\_\_

ITEM(S): Blood residue analysis  
of soil, rock, & artifact  
samples from the Higgins site

VENDOR: \_\_\_\_\_  
NAME  
\_\_\_\_\_  
STREET/P.O. BOX  
\_\_\_\_\_

REQUESTING: \_\_\_\_\_ NO SUBSTITUTE (omit #4 & #5) X SOLE SOURCE

JUSTIFICATION: No other institution provides this type of specialized  
analysis of blood residues on archaeological materials commercially.  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

PLEASE COMPLETE THE FOLLOWING:

1. Explain why no other product shall be suitable or acceptable to meet the need:

Service is not available elsewhere. Specialized chemical  
analyses by archaeologists are required.  
\_\_\_\_\_  
\_\_\_\_\_

2. Explain what the results would be if the product is not obtained or becomes unavailable:

Terms of the research design would not be met and further  
antigen analysis could not be completed.  
\_\_\_\_\_  
\_\_\_\_\_

3. Are sufficient funds available? Yes X No \_\_\_\_\_

4. Is the price fair and reasonable? Yes X No \_\_\_\_\_

5. What is the relationship of the State's price to the published list price? Are we getting a good discount?

No published list. University of Delaware is providing the state a 20% discounted price.

6. Is there another product which is comparable but cost more or less?

No.

7. If purchased previously, how does the current price compare with the previous price?

Not applicable

Signature: \_\_\_\_\_

Originator

It is determined this procurement is in compliance with COMAR 21.

Approval Granted: \_\_\_\_\_

Associate Procurement Officer

Approval Granted: \_\_\_\_\_

Agency Head Designee

## HIGGINS PHASE III

MARYLAND GEOLOGICAL SURVEY  
PURCHASE REQUEST

FROM: Ebright

DATE: 1-25-89

CHARGE CODE: 30.01.11

## Program

## Project

Object/Item

Fund

007

.002

PROGRAM CHIEF APPROVAL:

QUANTITY	DESCRIPTION OF MERCHANDISE	SUGGESTED VENDOR	APPROXIMATE COST
150 samples @ \$4.00	Blood residue analysis	University of Delaware	600.00

**PROTOCOL FOR THE DETECTION OF  
HEMOGLOBIN PRESENT ON ARTIFACTUAL MATERIAL**

**by  
D.C. Hyland**

**Cultural Resource Management Program (CRMP)  
Department of Anthropology  
University of Pittsburgh  
Pittsburgh, PA 15260**

**Not for quotation without permission.**

## HEMOGLOBIN DETECTION PROCEDURE

- 1) Draw 100 $\mu$ l 1XTBS (Tris buffered saline) into a pipetter.
- 2) Apply saline solution to the surface of the artifact, particularly edges and crevices, agitate the solution with the tip of the pipet during application, and withdraw sample using the pipetter. This 100 $\mu$ l sample may repeatedly be dispensed and drawn up (2-3 times) before proceeding to step 3.
- 3) Place one drop (approx. 10-15 $\mu$ l) of sample on to the test area of a Hemastix reagent strip. Follow the directive supplied with Hemastix. Match the reagent strip with the Hemastix color chart 40 seconds after application and read accordingly.
- 4) Place sample (one per artifact) into a labelled, sealable receiving vessel such as an Eppendorf micro tube and refrigerate.
- 5) Repeat steps 1-4 until sample ceases testing positive.

## SOLUTION PREPARATION

To make one liter (1l) of one molar (1M) Tris [Tris (Hydroxymethyl) Aminomethane]:

- 1) Combine 121.13g Tris and 850ml distilled and autoclaved H<sub>2</sub>O in a suitably sized beaker, fleaker, flask, or other vessel.
- 2) Magnetically stir solution and adjust pH to 7.5.
- 3) Adjust volume to 1l using distilled and autoclaved H<sub>2</sub>O.
- 4) Dispense into sealable sampling bottles and autoclave.

To make one liter (1l) of five molar (5M) NaCl:

- 1) Combine 292.95g NaCl and 900 ml distilled and autoclaved H<sub>2</sub>O in a suitably sized beaker, fleaker, flask, or other vessel.
- 2) Magnetically stir solution and adjust pH to 7.5.
- 3) Adjust volume to 1l using distilled and autoclaved H<sub>2</sub>O.
- 4) Dispense into sealable sampling bottles and autoclave.

To make one liter (1l) 1XTBS (Tris buffered saline):

- 1) Combine 20ml 1M Tris, 100ml 5M NaCl, and 880ml distilled and autoclaved H<sub>2</sub>O in a suitably sized beaker, fleaker, flask, or other vessel.
- 2) Magnetically stir solution and adjust pH to 7.5.
- 3) Adjust volume to 1l using distilled and autoclaved H<sub>2</sub>O.
- 4) Dispense solution into sealable sampling bottles and autoclave.

## REQUIRED LABORATORY EQUIPMENT

### Glassware

- Beakers
- Pasteur pipets
- Graduated cylinders
- Sampling bottles
- Eppendorf micro tubes
- Weigh boats
- Pipetter (capacity  $\approx 20-200\mu\text{l}$ )
- Pipet tips
- Distiller
- Autoclave
- Refrigerator
- pH Meter
- Balance
- Stirrer

## REQUIRED CHEMICALS AND REAGENTS

### Hemastix® Reagent Strips for Urinalysis

Ames Division, Miles Laboratories cat. no. 2816

### Tris (Hydroxymethyl) Aminomethane

Bio-Rad Laboratories cat. no. 161-0716

### Sodium Chloride

Fisher Scientific cat. no. S-271

### Hydrochloric acid (used to adjust pH)

Fisher Scientific cat. no. A-144

### Sodium Hydroxide (1N solution) (used to adjust pH)

Fisher Scientific cat. no. SS-266

Project file \_\_\_\_\_

TELEPHONE MEMORANDUM

MGS Staff member Doright

Person contacted Jay Custer

Telephone number (302) 737-5376

Project name Higgins

Site number (if applicable) 18AN489

Date 1-23-89 Time 10 AM

Notes:

Jay received Pitt protocol I sent him for blood residue. They use essentially the same procedure but w/o the buffer. Jay thinks the buffer enhances the # of positives - prob. the false positives - which is not what he would want to do. He recommends testing dirt & rocks 15+ to see the potential for false positives at the site. They normally charge \$5 a sample. He would charge \$4/sample for up to 150 samples, and \$3 per sample for more than 150. He would select dirt both from pedestals & random areas of the site & would be suspicious of results on artifacts. ~~Action needed:~~ if dirt and other rocks are positive, even if it was pedestal dirt. For tools, he recommended selecting only non-porous varieties. Said they'd had results with argillite & other relatively porous stones - even quartzite.

Other staff to be alerted:





**Maryland Department of Natural Resources**

**Maryland Geological Survey**

2300 St. Paul Street

Baltimore, Maryland 21218

Telephone: (301) 554-5500

William Donald Schaefer  
*Governor*

Torrey C. Brown, M.D.  
*Secretary*

Kenneth N. Weaver  
*Director*

Emery T. Cleaves  
*Deputy Director*

Division of Archeology  
(301) 554-5530

12 April 1989

Jay Custer  
Center for Archaeological Research  
University of Delaware  
Newark, Delaware

Dear Dr. Custer:

As per our discussion of 12 April 1989, we request the testing of 20 selected artifacts and/or samples for the presence or absence of blood residues. These artifacts are from the Higgins site (18AN489), which was excavated as part of a mitigation plan in connection with the construction of a State Railroad Administration building.

We request a written brief report of results and the return of the artifacts to the Maryland Geological Survey. We understand that the fee charged for this service will be \$100.

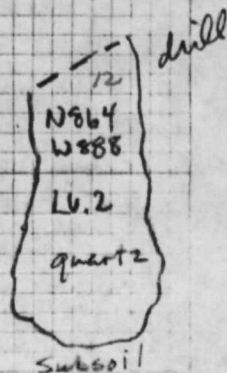
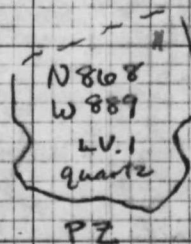
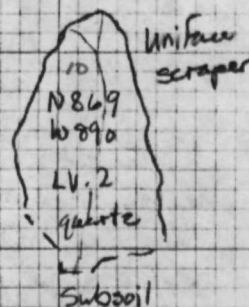
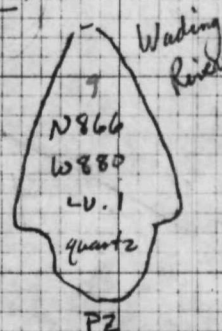
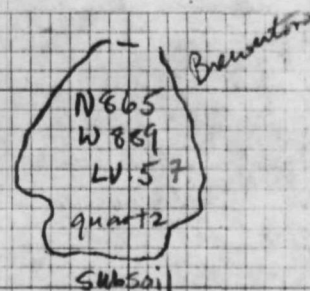
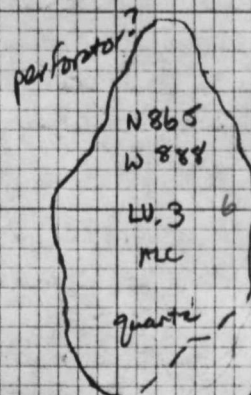
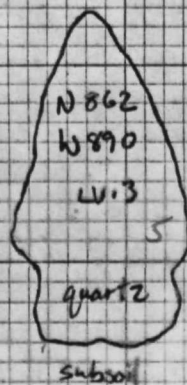
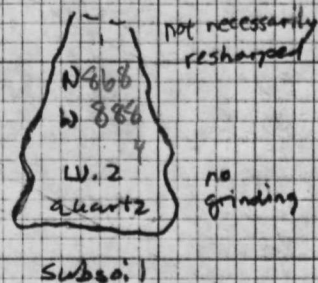
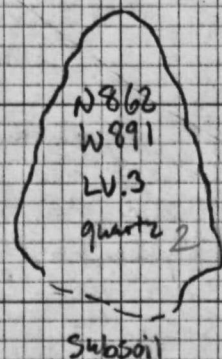
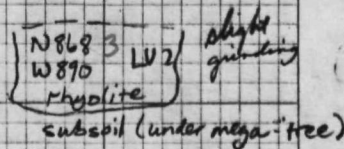
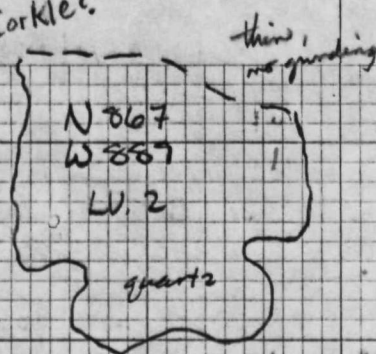
Upon completion of the analysis, please provide us an invoice containing a brief description of services provided, the fee charged, and your Federal Identification Number or Social Security Number. We will process your invoice as quickly as possible. If you have any questions or if I can be of further assistance, please contact me at 554-5539.

Sincerely,


Ira Beckerman  
Highway Archeology Project Director

# ARTIFACT SAMPLE #'s For BLOOD + RESIDUE ANALYSES

MacCorkle?



Flaked  
pt.  
base




Subsoil

N867  
W891  
LV. 5  
quartz

13

N 864  
W 890  
LV. 7

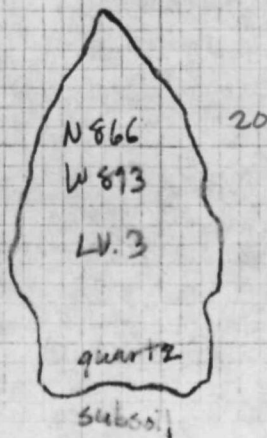
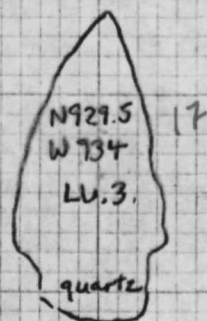
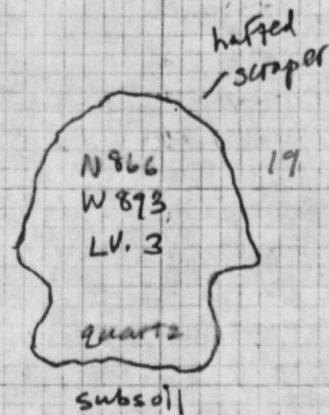
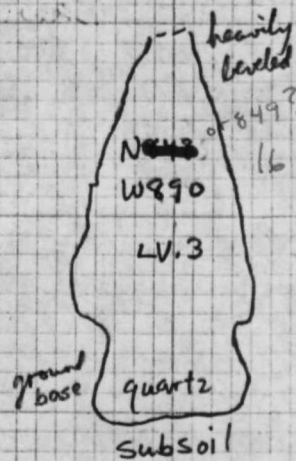
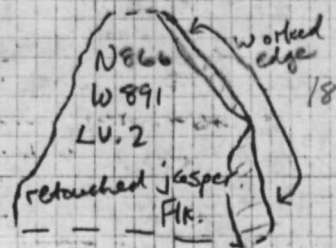
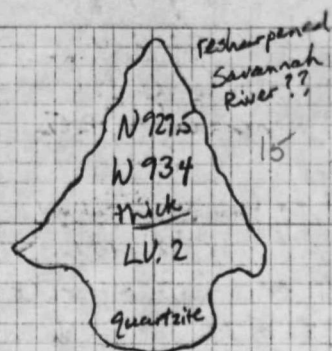


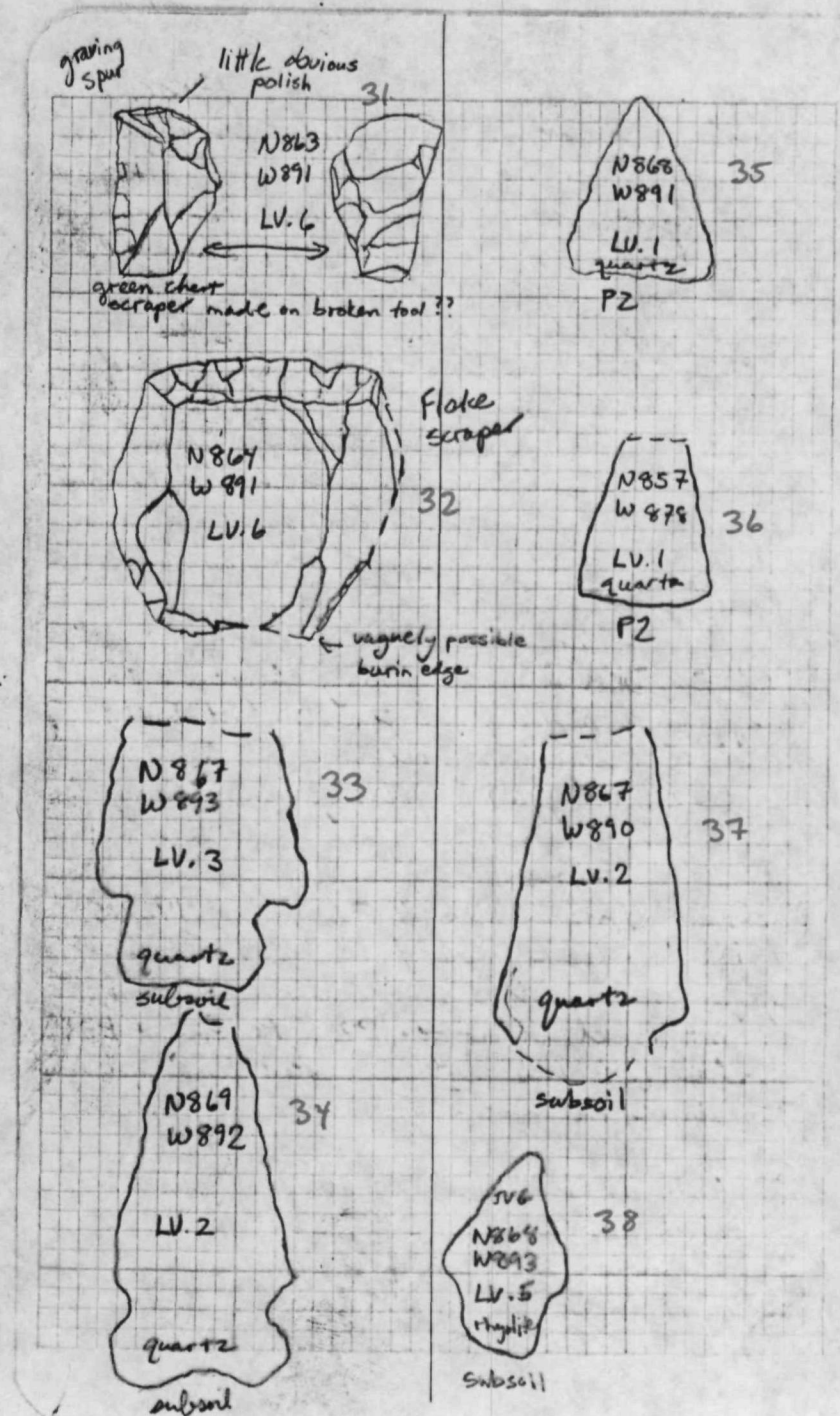
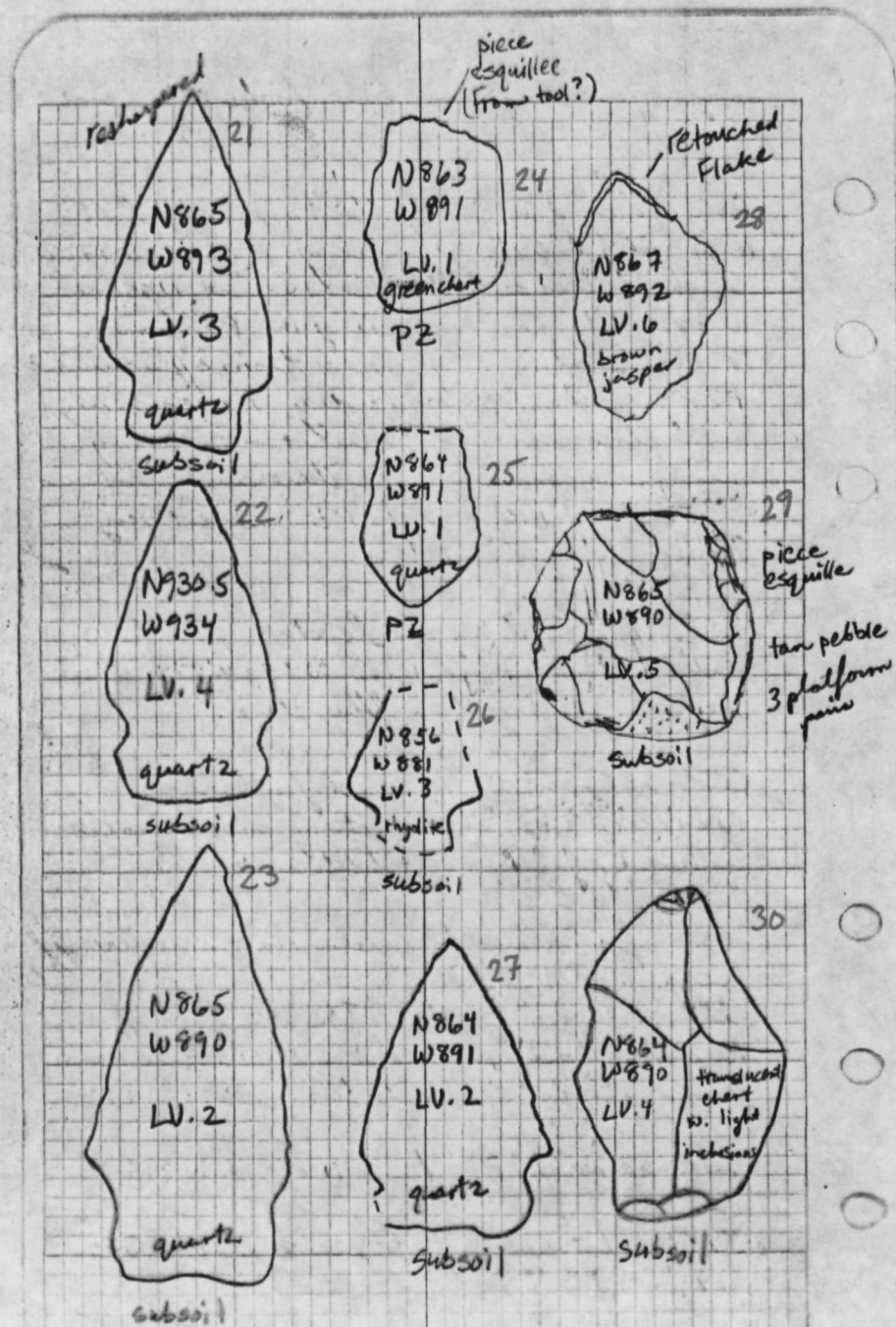
rock  
crystal

heavy  
grinding

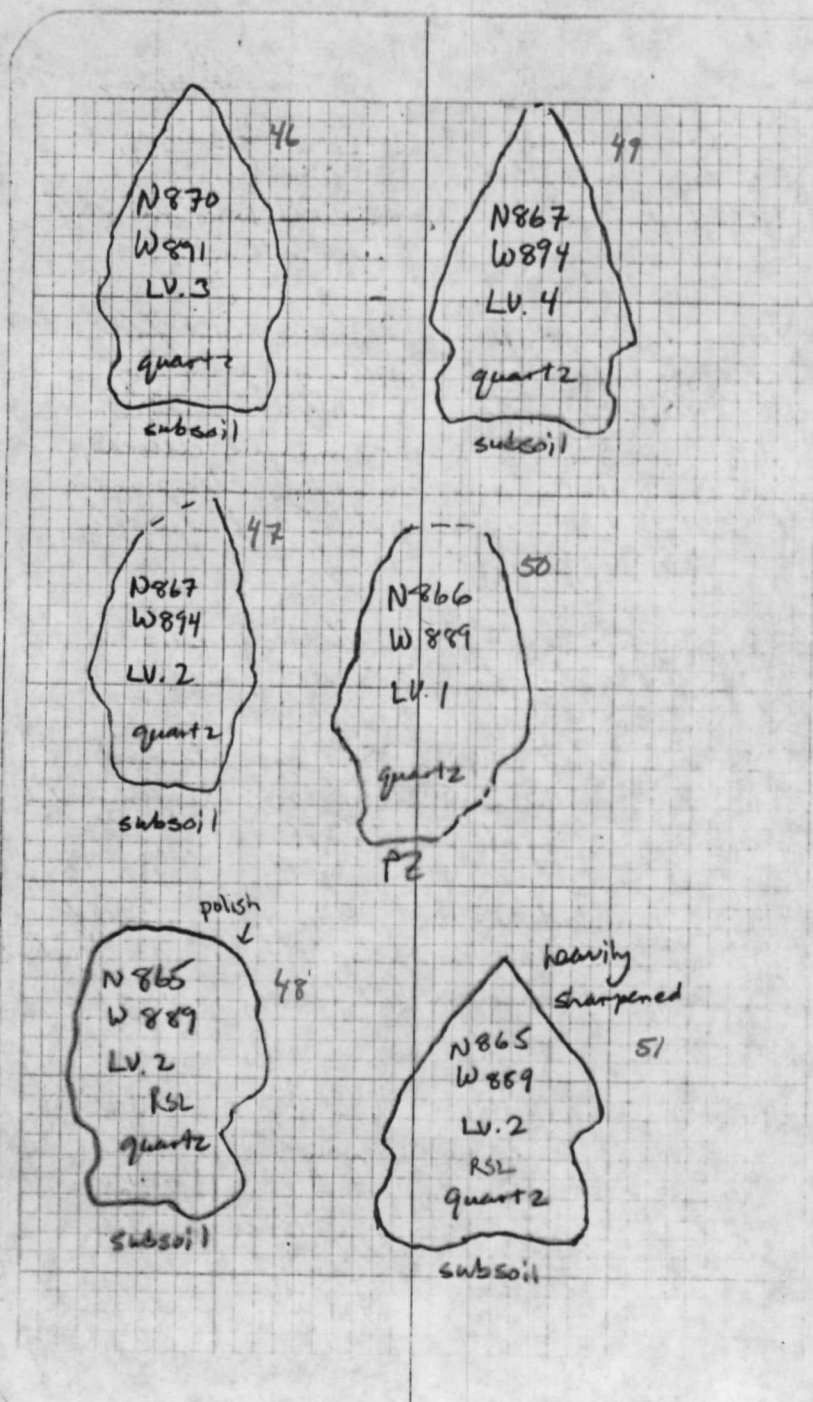
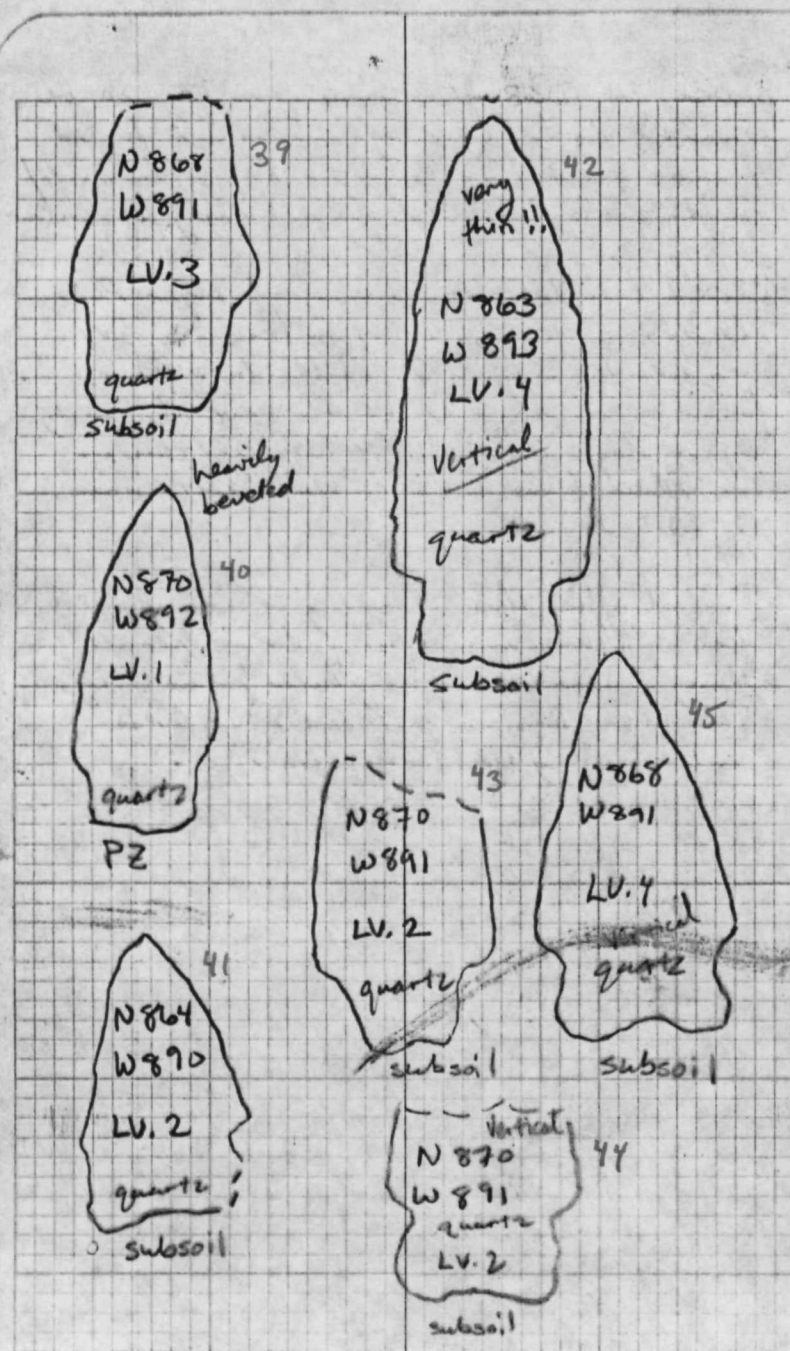
14

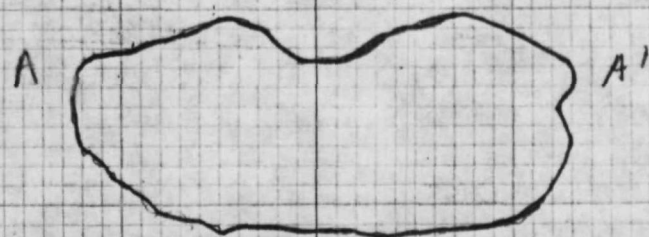
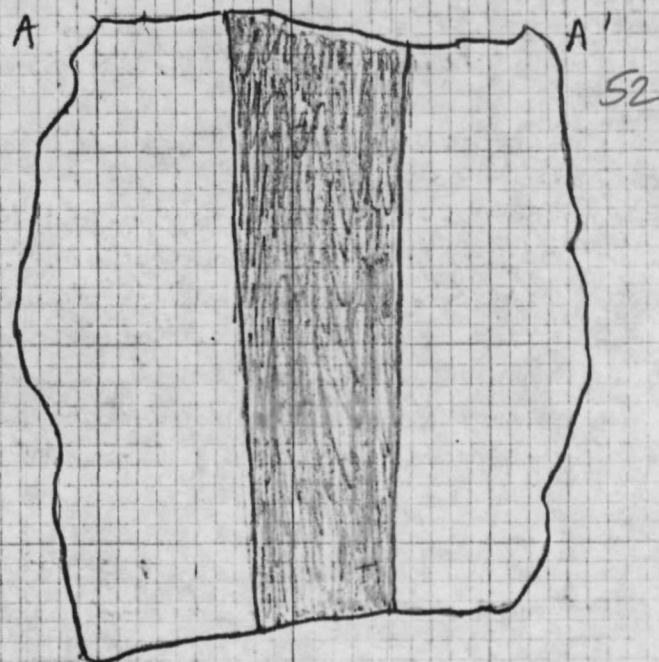






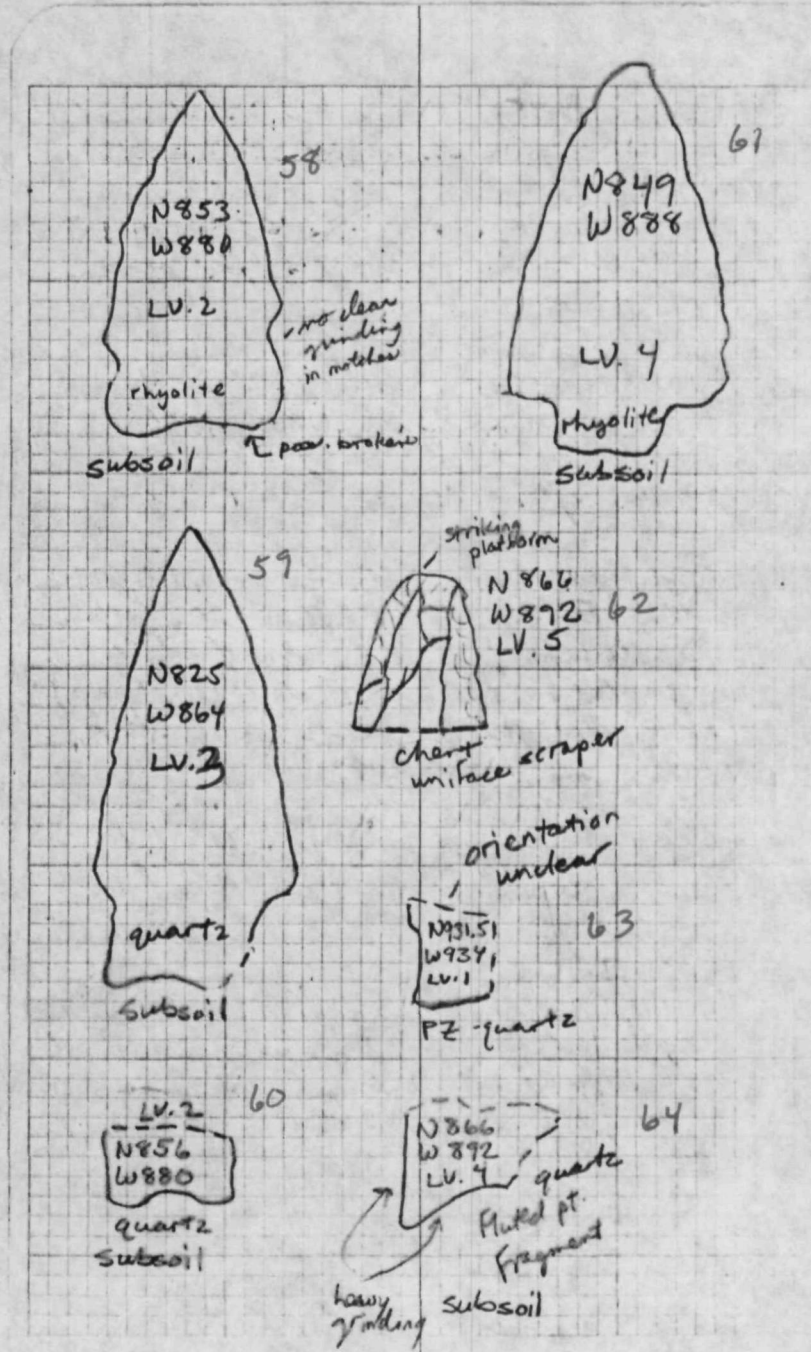
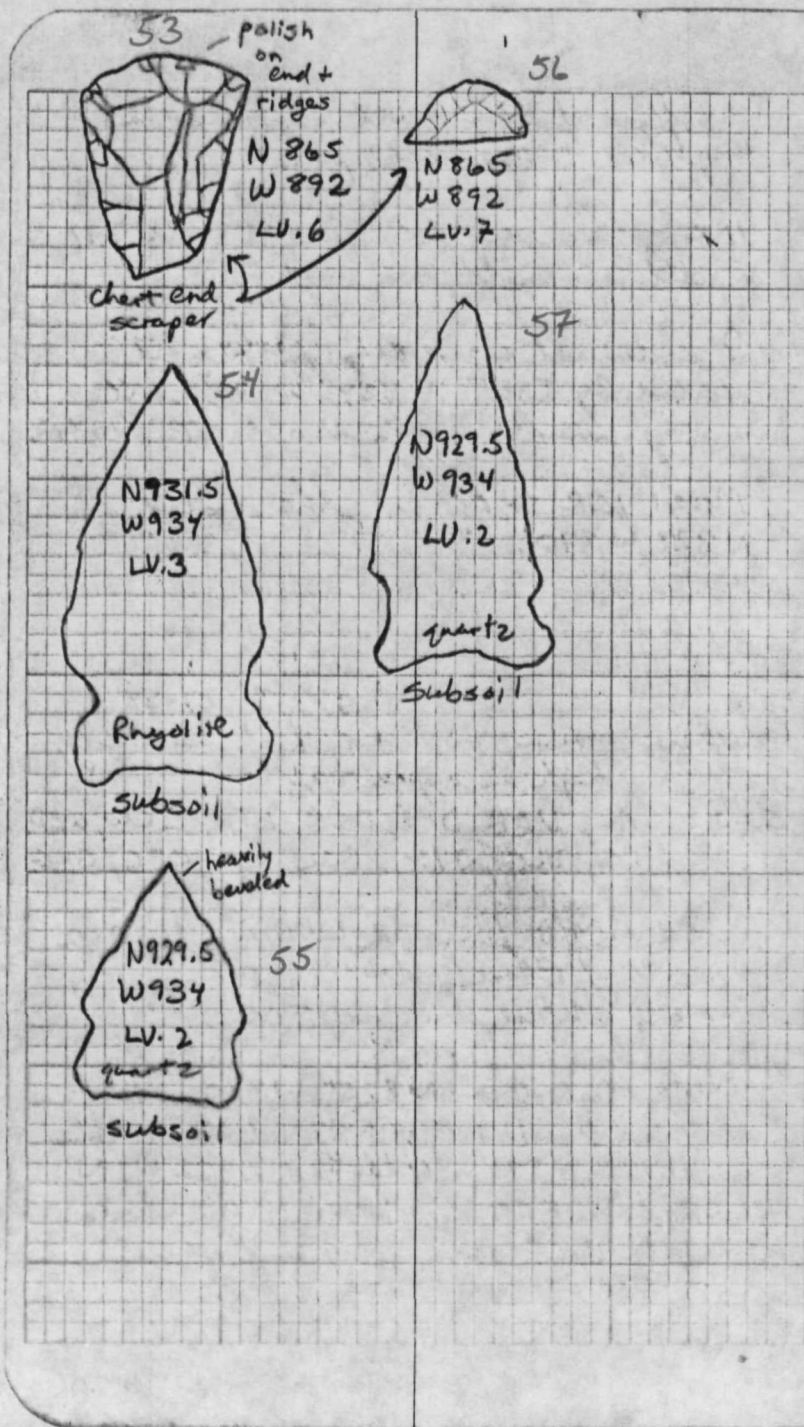




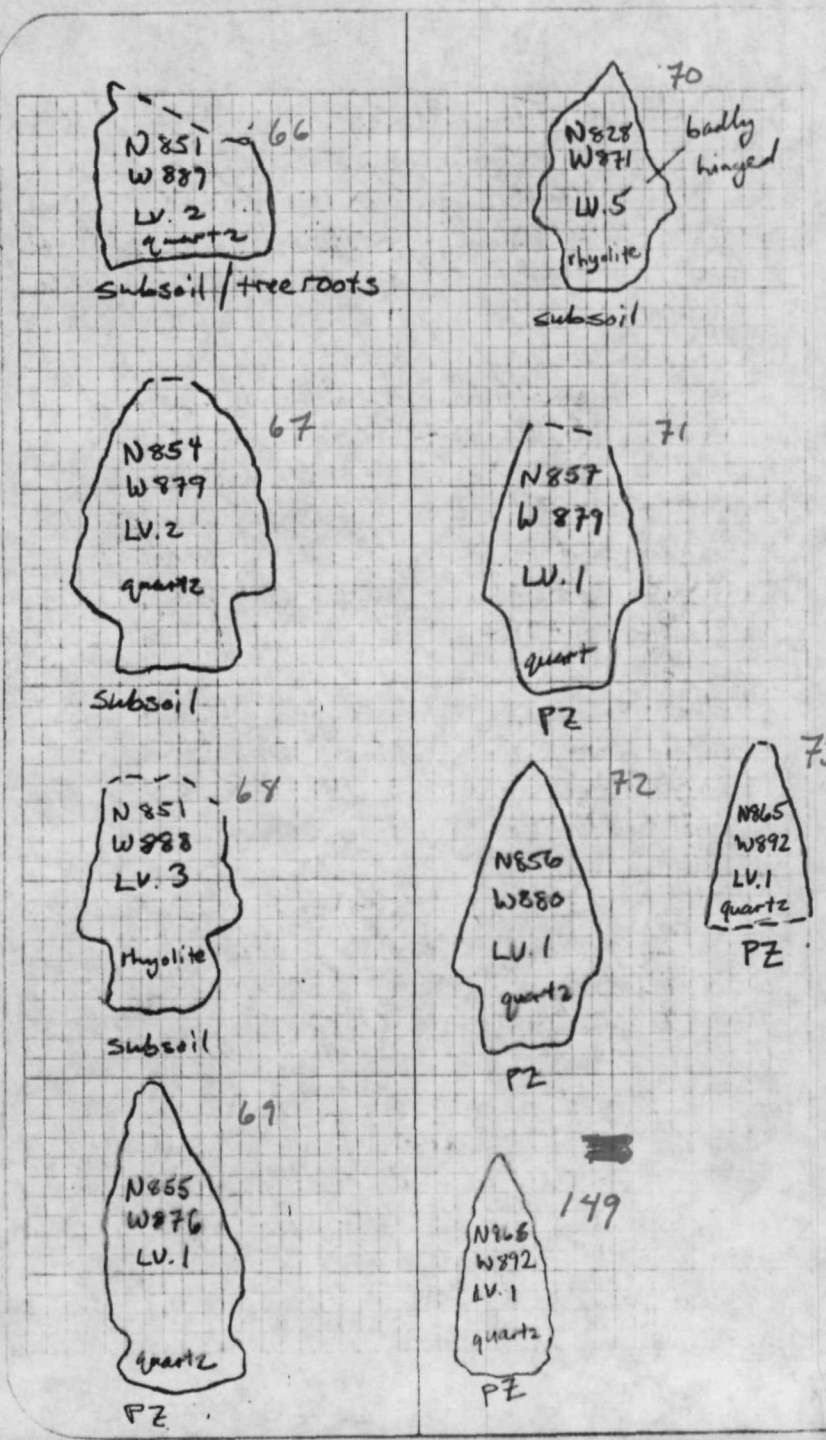
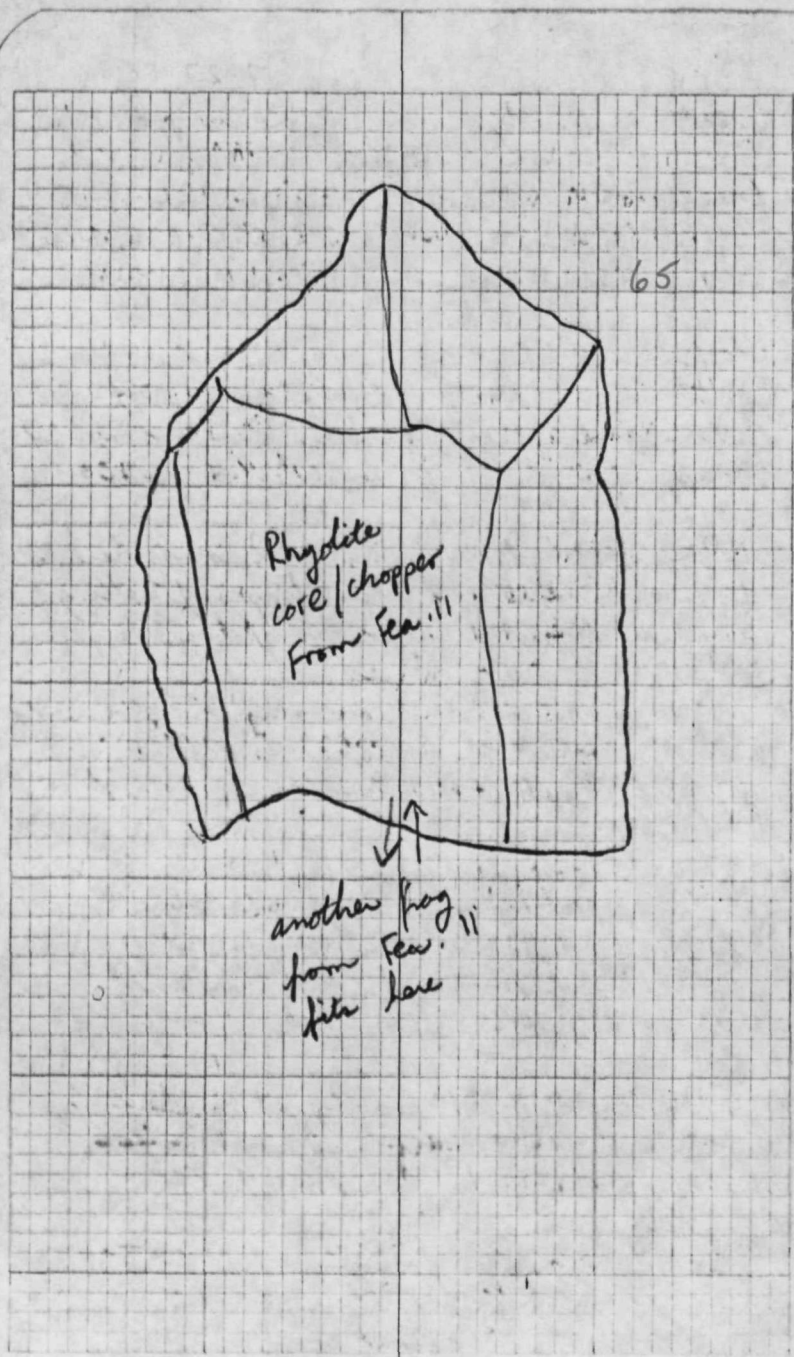


Abrader from Fea. 11  
N857 W890









pipe bowl  
frag. rim

N825  
W868  
LV. 2  
ceramic?  
cortinifer

Subsoil

127

N855  
W880  
LV. 2  
Quartz

77

PZ/Subsoil  
interface

N855  
W880  
LV. 1  
Quartz

74

PZ

N855  
W880  
LV. 1  
quartz

burnt

75

PZ

N862  
W892  
LV. 1  
quartz

76

PZ

N825  
W874  
LV. 1  
quartzite

78

PZ

N825  
W867  
LV. 3  
rhyolite

reworked

79

Subsoil

N855  
W882  
LV. 2  
quartz

80

PZ/Subsoil  
interface

N822  
W873  
LV. 3  
quartzite

81

Subsoil

very heavily  
ground notches  
& base

N826  
W870  
Fea. 13  
LV. 2

128 along w.  
rest of  
side ceramic  
view w. this  
fea.

Ceramic object - lug?  
no clear broken edges

N856  
W884  
LV. 1  
quartz

83

PZ

corrosion on 1 face

N822  
W873  
LV. 4  
rhyolite

82

Subsoil  
ground base  
& notches

N856  
W889  
LV. 2  
quartz

84

Subsoil / screen



